The Hawaiian Species of Enicospilus and Abanchogastra (Hymenoptera: Ichneumonidae)

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The species of *Enicospilus* indigenous to the Hawaiian Islands form a very distinct group within the genus, characterized by a peculiarly fine, mat sculpture, especially of the thorax, and exhibiting wide variation in color and a marked tendency in several of the species to break up into size-races and color-races. A considerable number of these variations have been described as distinct species and some later synonymized. All have the head with the same basic yellow or whitish color pattern embracing the orbits, face, and clypeus, usually the vertex, and rarely almost the entire head; in red forms the pattern is sometimes suppressed by lack of contrast, and rarely in dark forms it is largely reduced by the encroachment of the dark color. It should be noted that the dark color of none of the species is a true black but results from the addition of more or less black pigment to the typical ferruginous color.

Only three authors—Cameron, Ashmead and Perkins—have described Hawaiian species, and of these only Perkins had anything like a clear understanding of them. The last-named author[1] has made a very critical study of large numbers of specimens, and has summarized admirably the variation occurring in most of the species, especially in size, in color, and in the strength of the propodeal carina. It is unnecessary here to discuss this matter further. Suffice it to state that in order to identify species with certainty it is necessary to ignore color almost entirely, except in a few species, and depend upon structure. Among the most useful characters are the size, shape and position of the fenestra and of its scleromes, the former very constant, the latter variable, except for position, in most species; the degree and position of the thickening of the basal abscissa of the radius; the course and thickness of the discocubitus and the length of the second recurrent in relation to the basal abscissa of the subdiscoideus and the angle formed by these two veins and the consequent shape of the second discoidal cell; the relative lengths of the veins of the transverse brace (intercubitus, second abscissa of cubitus and second recurrent); the convexity of

[1] Fauna Hawaiiensis, 1,(6), Introduction: cix-cx, 1913, and Trans. Ent. Soc. London, 1914: 521-535, 1915.

the eyes and length of the malar space with the resulting effect upon the shape of the head; the degree of attenuation of the abdomen; the form and length of the ovipositor; the form of the aedeagus; and the form of the apical tarsal joints, especially in the male. By the use of these characters the Hawaiian species can be divided into several groups, some already described as distinct genera, but apparently of not more than subgeneric status.

Previously published descriptions of the color and Perkins' analysis of the variation in color, size and some features of structure and sculpture render detailed descriptions of the species unnecessary. Descriptive matter in the following discussion of the species is confined largely to that referring to the fenestra and its scleromes and the shape of the second discoidal cell. These structures furnish the most reliable specific characters that I have found in the Hawaiian species. The other characters of the venation mentioned above, mostly subject to some variation, are brought out in the figures.

All the figures are from drawings by my son, Arthur D. Cushman, of the Bureau of Entomology and Plant Quarantine.

Including the two species described in *Pleuroneurophion* and the one in *Eremotylus,* 25 names have been applied to Hawaiian species of *Enicospilus,* as follows:

Pleuroneurophion hawaiiensis Ashmead.
P. ferrugineus Perkins.
(*Eremotylus*) *Eremotyloides orbitalis* (Ashmead).
(*Ophion*) *Enicospilus lineatus* (Cameron).
(*Ophion*) *Enicospilus nigricans* (Cameron), preoccupied by *Ophion nigricans* Ruthe, and renamed *Enicospilus nigritulus* Morley. Synonymized by Perkins with *castaneus* Ashmead.
Enicospilus mauicola Ashmead.
Enicospilus kaalae Ashmead.
Enicospilus waimeae Ashmead.
Enicospilus variegatus Ashmead.
Enicospilus nigrolineatus Ashmead.
Enicospilus castaneus Ashmead.
Enicospilus henshawi Ashmead. Synonymized by Perkins with *lineatus* (Cameron).
Enicospilus molokaiensis Ashmead.
Enicospilus longicornis Ashmead.
Enicospilus semirufus Perkins. Synonymized by Perkins with *kaalae* Ashmead.
Enicospilus dispilus Perkins.
Enicospilus dispilus var. *pallipes* Perkins.
Enicospilus dimidiatus Perkins. Synonymized by Perkins with *mauicola* Ashmead.

Enicospilus tyrannus Perkins.
Enicospilus capnodes Perkins. Synonymized by Perkins with *mauicola* Ashmead.
Enicospilus melanochromus Perkins.
Enicospilus funereus Perkins.
Enicospilus ashmeadi Perkins.
Enicospilus bellator Perkins.
Enicospilus pseudonymus Perkins.

To these I am adding two new species, both in the subgenus *Eremotyloides*.

Among the more than 400 specimens that I have examined, including those in the United States National Museum and a lot kindly sent me by Elwood C. Zimmerman of the Bernice P. Bishop Museum in Honolulu (some identified by Perkins) I have recognized all but four of the species listed above. Of these four, *ferrugineus* Perkins and *pseudonymus* Perkins are placed in the following key on characters given in the original descriptions; and of the other two (*funereus* Perkins and *tyrannus* Perkins) the probable or possible positions are indicated.

The holotypes of all species of Ophionini described by Cameron, Ashmead, and Perkins (except that of *Pleuroneurophion hawaiiensis* Ashmead, which is in the United States National Museum) are in the British Museum.

In the key and discussions the terms *fenestra* and *sclerome* correspond to Perkins' terms "hyaline glabrous area of the discocubital cell" and "chitinous spot of the discocubital cell."

KEY TO HAWAIIAN SUBGENERA AND SPECIES OF ENICOSPILUS

1. Fenestra more or less distinct; mesoscutum of normal conformation 2
   Fenestra lacking; mesoscutum "somewhat strongly compressed at the sides in such a way that the middle third of its width appears elevated" ..... (♂) 17. **pseudonymus** Perkins.
2. Abdomen extremely slender, tergites 1-5 in female, 1-4 in male, longer than deep (fig. 17); ovipositor very short, stout, and recurved (fig. 17); (aedeagus as in fig. 2a) (subgenus *Eremotyloides* Perkins) 3
   Abdomen less conspicuously slender, tergite 4 in both sexes deeper than long; ovipositor straight and not especially short, rarely strongly exserted 5
3. Basal abscissa of radius straight, thickened only in about basal third; fenestra small, not extending beyond the thickening; sclerome, when present, broadly oval and lying along proximal margin of fenestra (figs. 1 and 2) 4
   Basal abscissa of radius with a slightly curved thickening occupying more than its basal half; fenestra large, embracing fully half the apical portion of the discocubital cell; sclerome long and narrow and lying along lower margin of fenestra (fig. 3) ..... 3. **fullawayi,** new species.

4. Fenestra without sclerome (fig. 1); second abscissa of cubitus thrice as long as intercubitus (fig. 1); metapleura moderately convex (fig. 21).....(♀ ♂) 1. **orbitalis** (Ashmead).
One sclerome present, the proximal, this rather large, oval, with its long axis vertical to costal margin (fig. 2); metapleura conspicuously convex (fig. 22).....(♀ ♂) 2. **perkinsi,** new species.

5. Discocubitus sharply angled and with a short, thick ramellus; fenestra extremely small, below base of radius, usually with a very minute, colorless proximal sclerome on lower proximal margin (fig. 4); ovipositor prominently exserted (fig. 18); (aedeagus as in fig. 4a) (subgenus *Pleuroneurophion* Ashmead).....6
Discocubitus at most weakly angled and without ramellus; fenestra not as above; ovipositor not exserted (subgenus *Enicospilus* Stephens).....7

6. Dark brown.....(♀ ♂) 4. **hawaiiensis** (Ashmead).
Ferruginous.....(sex?) 5. **ferrugineus** (Perkins).

7. Fenestra occupying fully three-fourths width and nearly half area of narrow distal portion of discocubital cell, with one sclerome, the proximal, which is small, oval or pyriform, and on lower proximal margin of fenestra, closer to discocubitus than to radius and basad of a line drawn perpendicular to costa through base of radial cell (figs. 5-7); female hypopygium very prominent (fig. 19).....8
Fenestra smaller and narrower, proximal sclerome, when present, closer to radius than to discocubitus, usually distad of base of radial cell (figs. 8-15), female hypopygium not especially prominent (fig. 20).....10

8. Discocubitus at least slightly thickened at junction of first recurrent and cubitus and sometimes slightly angled (figs. 5 and 6).....9
Discocubitus neither thickened nor angled (fig. 7).....(♀ ♂) 8. **kaalae** Ashmead.

9. Thorax laterally mat, densely ruguloso-punctate to rugulose; discocubitus usually angulate (fig. 5); aedeagus as in fig. 5a; ferruginous.....(♀ ♂) 6. **molokaiensis** Ashmead.
Thorax laterally shining, very minutely alutaceous and finely irregularly aciculate and sparsely punctate; discocubitus not angulate (fig. 6); aedeagus as in fig. 6a; dark.....(♂) 7. **melanochromus** Perkins.

10. Fenestra small, usually about as long as broad, not or barely a third as long as basal abscissa of radius (figs. 8-9, 11-13), rarely (*bellator*, fig. 10) represented only by a narrow hairless area along radius; aedeagus as in figs. 8a and 11a.....11
Fenestra rather large, fully half as long as basal abscissa of radius (figs. 14 and 15); aedeagus as in figs. 14a and 15a.....16

11. Scutellum transversely flat between carinae, very densely punctate or rugulose and dull, carinae usually prominent; length of malar space at dorsal articulation of mandible, at least in female, nearly or quite half as long as basal width of mandible; apical tarsal joint in male (fig. 24) strongly depressed, parallel-sided or even broader toward base than at apex.....12
Scutellum transversely convex between carinae, more sparsely punctate and usually more or less shining, if dull the surface very finely mat and with well separated punctures, carinae not unusually prominent; malar space distinctly less than half as long as basal width of mandible; apical tarsal joint (fig. 25) broadening toward apex and not especially depressed.....14

12. Fenestra not exceptionally small, usually with a well defined proximal sclerome and frequently a trace of a central sclerome, rarely without scleromes (figs. 8 and 9)..... 13
Fenestra very small and narrow with no proximal sclerome, but with a faintly sclerotized lower margin (fig. 10)..... (♀ ♂) 11. **bellator** Perkins.

13. Head distinctly elongate, apparently longer from vertex to apical margin of clypeus than broad, eyes rather shallowly convex, malar space in female more than half, in male about half, as long as basal width of mandible; fenestra with only the proximal sclerome (fig. 8), rarely without any; antenna, especially in female, unusually short..... (♀ ♂) 9. **castaneus** Ashmead.
Head broader than long, eyes deeply convex, malar space in female barely, in male less than, half as long as basal width of mandible; fenestra with large proximal and small central sclerome (fig. 9); antenna long..... (♀ ♂) 10. **dispilus** Perkins.

14. Thorax, legs, and abdomen not contrastingly colored, mostly dark or mostly red; scutellum finely punctate and more or less shining..... 15
Thorax and legs yellowish and black; abdomen dark with dorsal edge yellow; scutellum coarsely punctate and mat..... (♀ ♂) 14. **variegatus** Ashmead.

15. Sclerome very large, nearly equal to fenestra in area (fig. 12)..... (♀) 13. **waimeae** Ashmead.
Sclerome much smaller, sometimes lacking (fig. 11)..... (♀ ♂) 12. **lineatus** (Cameron).

16. Fenestra with only one sclerome, the proximal, this distinctly distad of a line perpendicular to costal margin through base of radial cell, elongately triangular and with a more or less distinct appendix to apex of fenestra (fig. 14); yellowish, with prescutum, mesosternum and propodeum largely black; aedeagus as in fig. 14a..... (♀ ♂) 15. **nigrolineatus** Ashmead.
Fenestra with two scleromes, the proximal almost equilaterally subtriangular without appendix and basad of a line perpendicular to costal margin at base of radial cell and a central sclerome irregularly elongate or subovate (fig. 15); ferruginous, at most with piceous stains on thorax; aedeagus as in fig. 15a..... (♀ ♂) 16. **longicornis** Ashmead.

Subgenus **Eremotyloides** Perkins

Eremotyloides Perkins, Trans. Ent. Soc. London, 1914: 530, 1915.

Genotype.—*Eremotylus orbitalis* Ashmead (p. 532). Monobasic.

This subgenus differs from the typical subgenus virtually only in the extreme slenderness of the abdomen (sometimes less evident in the male) and in the short, recurved ovipositor (fig. 17). Its status as a subgenus may be found to be untenable when the *Enicospilus* fauna of the world is studied, but within the fauna of the restricted area it differs so conspicuously from the bulk of the species that it seems well to recognize it.

1. **Enicospilus (Eremotyloides) orbitalis** (Ashmead), new combination

Eremotylus orbitalis Ashmead, Fauna Hawaiiensis, **1** (3) : 345, 1901.

Eremotyloides orbitalis (Ashmead), Perkins, Trans. Ent. Soc. London, 1914 : 532, 1915.

Of this species I have seen three males and one female, each from a different island: Hawaii, Koebele; Oahu, Waianae Mts., 2,500 feet, May 1892, Perkins; Kauai, Mts. Waimea, 4,000 ft., 1894, Perkins; Maui, Honomanu, June 28, 1920, E. H. Bryan, Jr.; the first three in the United States National Museum, the last in the Bernice P. Bishop Museum.

All these specimens are dark, but Perkins records specimens with red thorax and pale legs, and suggests the possibility of there being an entirely pale form.

The sculpture of the thorax in this species is notably finely and evenly alutaceous and mat, with very little tendency to rugulosity except on the propodeum, where it is very fine. The second discoidal cell (fig. 1) is notably short and broad, with the discocubitus strongly arched and the second recurrent much more than half as long as the basal abscissa of the subdiscoideus. The radius is thickened only in about its basal third, and the fenestra is very small and rather poorly defined and lacks all trace of scleromes.

2. **Enicospilus (Eremotyloides) perkinsi,** new species

Very distinct from *orbitalis* in the possession of a rather large, dark-colored sclerome and from all recorded specimens of that species in its largely or entirely bright ferruginous color.

Female (holotype).—Length 19.0 mm., antenna 12.0 mm., forewing 11.0 mm.

Much more shining than *orbitalis* and virtually lacking the very fine alutaceous sculpture characteristic of that species.

Face sparsely punctate, slightly wider at level of clypeal foveae than frons; clypeus punctate only basally; head elsewhere polished. Pronotum obliquely striate laterally; mesoscutum subpolished, very finely and sparsely punctate discally; scutellum rather strongly convex between carinae, very finely alutaceous and more coarsely punctate than mesoscutum; mesopleuron and metapleuron striato-rugulose, metapleuron prominently convex (fig. 22); prepectus striato-punctate; mesosternum sparsely punctate; propodeum without carina, finely mat basad of normal position of carina, irregularly rugose apicad, slightly impressed medially. Forewing (fig. 2) with basal abscissa of radius strongly swollen in basal third; fenestra very small, at extreme base of radius, with dark, broadly oval, and sharply defined proximal sclerome with long axis nearly perpendicular to costal margin; intercubitus two-thirds as long as second abscissa of cubitus, which is somewhat longer than second recurrent; discocubitus arched in middle so that discoidal cell is wider there than at apex; nervulus distinctly antefurcal; nervellus broken somewhat below middle. Legs, especially femora, rather stout, coxae and femora shin-

ing, very minutely sculptured. Abdomen (fig. 17) shining, nearly three times as long as head and thorax combined, exceedingly slender, fifth tergite distinctly longer than deep, hypopygium extending slightly beyond apex of last tergite so that sheath is directed somewhat dorsocephalad; ovipositor short, stout basally, recurved.

Bright ferruginous; head almost uniformly colored; abdomen blackish from near base of third tergite to apex.

Male (allotype).—Essentially like holotype. Aedeagus as in fig. 2a.

Type locality.—Kokee, Kauai.

Holotype and *allotype.*—Bernice P. Bishop Museum.

Paratypes.—No. 56660, United States National Museum.

Two specimens of each sex, all from Kauai, the holotype taken at light July 6, 1937, by E. C. Zimmerman; the allotype, in September, B. P. Clark; the female paratype at 4,000 ft. April 28, 1919, J. A. Kusche; and the male paratype at Kaholuamano, April 1920, J. A. Kusche.

In the female paratype the dark color on the abdomen is very dilute, and the two males are intermediate in this respect.

3. **Enicospilus (Eremotyloides) fullawayi,** new species

Female.—Length 19.0 mm., antenna 12.0 mm., forewing 11.0 mm.

Extremely similar in habitus, structure, sculpture, and color to *orbitalis,* and differing virtually only by the following characters:

Thickening of radius (fig. 3) gently curved and occupying nearly two-thirds of the length; fenestra very large, occupying about three-fourths the width and fully half the area of apical portion of discocubital cell; proximal sclerome linear and lying along lower margin of fenestra at proximal end entirely proximad of a line through base of radial cell perpendicular to costal margin, second discoidal cell rather narrow, discocubitus gently arched, second recurrent distinctly less than half as long as basal abscissa of subdiscoideus.

Type locality.—Halemanu, Kauai.

Holotype.—No. 56661, United States National Museum.

A single female captured June 8, 1919, by H. T. Osborn.

Subgenus **Pleuroneurophion** Ashmead

Pleuroneurophion Ashmead, Proc. U. S. Nat. Mus. **23**: 86, 1900; Fauna Hawaiiensis, 1(3): 342, pl. 9, fig. 1, 1901; Perkins, Trans. Ent. Soc. London, 1914: 521, 529, 1915.

Genotype.—*Pleuroneurophion hawaiiensis* Ashmead.

Both the angulate and thickened discocubitus and the very small fenestra situated at the very base of the radius (fig. 4) characteristic of this subgenus occur elsewhere in *Enicospilus,* usually not in combination. Among the Hawaiian species the angulate discocubitus appears in *molokaiensis,* though in much less exaggerated form, but that species has a large fenestra. The fenestra in *orbitalis* and

perkinsi of the subgenus *Eremotyloides* is comparable in size and location to that of *Pleuroneurophion,* but there is no trace of thickening or angulation of the discocubitus. The only really anomalous character of this subgenus is the strongly exserted ovipositor (fig. 18). None of the Oriental species referred, because of the angled discocubitus, to *Pleuroneurophion* by Cameron, Szepligeti, and Uchida agrees with the character of the ovipositor.

4. **Enicospilus (Pleuroneurophion) hawaiiensis** (Ashmead), new combination

Pleuroneurophion hawaiiensis Ashmead, Proc. U. S. Nat. Mus. **23**: 86, 1900; Fauna Hawaiiensis, **1** (3) : 342, pl. 9, fig. 1, 1901.

I have examined 48 specimens of both sexes, including the unique type, 10 specimens identified by Ashmead as *Ophion nigricans* Cameron, and 37 received from Mr. Zimmerman, all taken in the neighborhood of Humuula. All specimens are from the island of Hawaii. This fact may account for the very great uniformity in size and very dark color of the specimens.

5. **Enicospilus (Pleuroneurophion) ferrugineus** (Perkins), new combination

Pleuroneurophion ferrugineus Perkins, Trans. Ent. Soc. London, 1914: 533, 1915.

There is nothing in the very brief description of this species, except the color, that will distinguish it from *hawaiiensis,* and it may prove to be merely the red phase of that species. It is known only from the island of Maui. Perkins gives no indication of the number, size or sex of the specimens that he had.

Subgenus **Enicospilus** Stephens

6. **Enicospilus (Enicospilus) molokaiensis** Ashmead

Enicospilus molokaiensis Ashmead, Fauna Hawaiiensis, **1** (3) : 344, 1901; Perkins, Trans. Ent. Soc. London, 1914: 523, 533, 1915.

This and the next two species form a group characterized by the large fenestra (figs. 5-7) occupying nearly half the area and fully three-fourths of the width of the apical portion of the discocubital cell, with the small pyriform or oval proximal sclerome at the lower proximal angle closer, usually much closer, to the discocubitus than to the radius and mostly or entirely proximad of a line perpendicular to the costa through the base of the radial cell; the discocubitus (except in *kaalae*) more or less thickened in the middle and sometimes (*molokaiensis*) angulate or subangulate, but without a ramellus; the second discoidal cell with upper and lower margins subparallel for fully half its length (fig. 19); and the aedeagus

(figs. 5a and 6a) with the apical, bulblike swelling not rising above the general dorsal margin.

The present species, of which I have seen about 70 specimens from Oahu, Hawaii, Kauai, Maui and Molokai, is unusually constant in color, apparently always ferruginous, and exhibits a gradation in size from 10 to 20 mm., with the smaller specimens predominating.

Thickening of radius (fig. 5) occupying about the basal half of abscissa and with a slight upward curvature; sclerome elongate pyriform with a longer or shorter appendix, just proximad of a line perpendicular to costa through base of radial cell; intercubitus one-fourth to one-third as long as second abscissa of cubitus, which is much longer than second recurrent; discocubitus with thickening angulate or subangulate, cubital portion nearly straight; second discoidal cell narrow, upper and lower margins parallel, lower posterior angle approximately a right angle, second recurrent a third or less as long as basal abscissa of subdiscoideus; aedeagus (fig. 5a) very weakly swollen below at apex.

7. **Enicospilus (Enicospilus) melanochromus** Perkins

Enicospilus melanochromus Perkins, Trans. Ent. Soc. London, 1914: 523, 533, 1915.

Of this species, described only in a key to the Hawaiian species, I have seen only two males, both from Mt. Tantalus, Oahu, and both identified by myself by comparison with the description. If these specimens are correctly identified the species can be distinguished from *molokaiensis* by its dark color; by the greater length of the thickened portion of the radius; by the broader and less attenuated sclerome; by the longer intercubitus, which is about half as long as the second recurrent; by the somewhat less distinctly angulate and thickened discocubitus; by the acute lower posterior angle of the second discoidal cell (fig. 6); and by the more strongly swollen apex of the aedeagus (fig. 6a).

8. **Enicospilus (Enicospilus) kaalae** Ashmead

Enicospilus kaalae Ashmead, Fauna Hawaiiensis, **1** (3): 347, 1901; Perkins, Fauna Hawaiiensis, **2** (6): 57, 1910; Trans. Ent. Soc. London, 1914: 524, 533, 1915.

Enicospilus semirufus Perkins, Trans. Ent. Soc. London, 1902: 142; Morley, Rev. Ichn. Brit. Mus., **1**: 48, 1912.

Of this species I have seen 25 specimens from Oahu, Kauai, and Maui.

In both size and color it is unusually constant, being large and blackish with the abdomen dark red except the petiole and the apex.

Perkins himself synonymized his *semirufus* with *kaalae*.

This species shares with *molokaiensis* and *melanochromus* the large fenestra (fig. 7) with the small, oval, proximal sclerome at the lower proximal corner of the fenestra and basad of a line perpendicular to the costa at the base of the radial cell and the prominent female hypopygium (fig. 19); but differs from both in the evenly curved and unthickened discocubitus and from *molokaiensis* in the form of the aedeagus, in which it resembles *melanochromus*. The sclerome varies slightly in shape and size; the intercubitus is about half as long as the second abscissa of the cubitus; and the second recurrent is about one-third as long as the basal abscissa of the subdiscoideus, these two veins forming a right or slightly obtuse angle (fig. 7).

9. **Enicospilus (Enicospilus) castaneus** Ashmead

Ophion nigricans Cameron, Trans. Ent. Soc. London, 1883: 193 (preoccupied by *O. nigricans* Ruthe, Stett. Ent. Zeitg. **20**: 378, 1859); Ashmead, Fauna Hawaiiensis, 1 (3): 341, 1901.

Enicospilus castaneus Ashmead, Fauna Hawaiiensis, 1(3): 349, 1901; Perkins, Trans. Ent. Soc. London, 1914: 528, 534, 1915.

Ophion nigritulus Morley, Rev. Ichn. Brit. Mus., **1**: 64, 1912 (substitute name for *O. nigricans* Cameron, preoccupied).

This and the next five species (figs. 8-13) constitute a group characterized as follows: Fenestra rather small, about as broad as long and underlying much less than half length of basal abscissa of radius, proximal sclerome very variable in size and shape, and sometimes absent, but when present always distad of a line perpendicular to costal margin at base of radial cell, rarely (*bellator*, fig. 10) fenestra reduced to a narrow area without sclerome; aedeagus (figs. 8a, 11a) with apex very strongly swollen both below and above. The three species of which I have seen abundant material (*castaneus, dispilus* and *lineatus*) are among the most protean in the genus with respect to both size and color of individuals and size and form of the proximal sclerome.

The present species, of which I have seen more than 100 specimens, all from the island of Hawaii, exhibits all gradations in color from entirely ferruginous (*castaneus*) to almost entirely black (*nigritulus*) and in size from 13 mm. to 23 mm. The sclerome varies from a fairly large, triangular sclerome to total absence.

This and the next two species differ from the other three species of the group in the transversely flat and very densely and coarsely punctate scutellum with unusually high carinae, in the unusually long malar space, in the second discoidal cell being long and narrow with its upper and lower margins parallel in about its apical third

and, in the male, in having the apical tarsal joints (fig. 24) strongly depressed and parallel-sided or even a little broader basad of middle than at apex. The malar space reaches its maximum length in the female of the present species, in which it is combined with unusually shallowly convex eyes to produce a relatively long, narrow head. The antennae in *castaneus,* especially in the female, are unusually short, not reaching the apices of the spread wings. The male is less easily distinguished from that of *dispilus,* but has the malar space definitely longer and always lacks a central sclerome in the fenestra, whereas *dispilus* has at least a trace of one.

10. **Enicospilus (Enicospilus) dispilus** Perkins

Enicospilus dispilus Perkins, Trans. Ent. Soc. London, 1902: 143; 1914: 528, 534, 1915.

Enicospilus dispilus var. *pallipes* Perkins, Trans. Ent. Soc. London, 1902: 143.

I have seen 40 specimens from Oahu, Molokai, Maui, Hawaii, and Kauai. In his 1915 paper Perkins does not mention his variety *pallipes* by name, merely stating that "Kauai specimens have the antennae and more or less of the legs pale, yellowish-brown." So far as can be judged from the few specimens from that island that I have seen, this difference seems to hold. All of the specimens from the island of Hawaii that I have seen are largely or entirely ferruginous, only restricted areas of the thorax being somewhat darker in some specimens. This form appears not to have been named, possibly because of confusion with *castaneus,* which was the case with most of the ferruginous specimens in the National Museum, though one was erroneously labeled *waimeae* by Ashmead.

The species is easily distinguished from its closest relative (*castaneus*) by the wing characters (fig. 9) of moderately large triangular proximal sclerome and very small almost colorless central sclerome, shorter malar space, and strongly convex eyes.

11. **Enicospilus (Enicospilus) bellator** Perkins

Enicospilus bellator Perkins, Trans. Ent. Soc. London, 1914: 528, 533, 1915.

This species, of which I have seen only four specimens from Hawaii and one from Molokai, is very distinct in the form of the fenestra (fig. 10), which is about twice as long along radius as broad and lacks distinct scleromes, although there is a faint sclerotization along the lower margin. All five specimens are ferruginous, like the type.

12. **Enicospilus lineatus** (Cameron)

Ophion lineatus Cameron, Trans. Ent. Soc. London, 1883: 192; Ashmead, Fauna Hawaiiensis 1 (3): 342, 1901.

Enicospilus mauicola Ashmead, Fauna Hawaiiensis, 1 (3): 347, 1901; Perkins, Trans. Ent. Soc. London, 1914: 526, 534, 1915. New synonymy.

Enicospilus henshawi Ashmead, Fauna Hawaiiensis, 1 (3): 349, 1901.

Enicospilus dimidiatus Perkins, Trans. Ent. Soc. London, 1902: 143; Morley, Rev. Ichn. Brit. Mus., 1: 49, 1912. New synonymy.

Enicospilus capnodes Perkins, Fauna Hawaiiensis, 2 (6): 679, 1910. New synonymy.

Henicospilus lineatus (Cameron) Morley, Rev. Ichn. Brit. Mus., 1: 47, 52, 1912.

Enicospilus lineatus (Cameron) Perkins, Trans. Ent. Soc. London, 1914: 526, 1915.

Enicospilus ashmeadi Perkins, Trans. Ent. Soc. London, 1914: 527, 1915. New synonymy.

This and the next two species differ as a group from the three preceding species in the form of the second discoidal cell, which is shorter and broader with its upper and lower margins convergent from somewhat basad of the apical third to the apex, and in the more strongly convex scutellum with lower carinae and sparser sculpture.

This abundant species exhibits to the extreme the tendency to break up into color-phases and size-phases. The names *lineatus* and *henshawi* represent the small red form, *dimidiatus* the small dark form, and *mauicola* and *capnodes* the large dark form, while the large red form has not been named; *ashmeadi* represents both of the large forms without the sclerome. In the material that I have examined there is comparatively less intergradation between the forms than in any of the other species. The names applying to the various phases may be of use in certain sorts of studies but I doubt their taxonomic value.

The three valid names in the varietal sense are *lineatus, dimidiatus,* and *mauicola.* The others, *capnodes* and *ashmeadi,* are synonymous with *mauicola.* The coarser punctation on the scutellum of *ashmeadi* is merely variation, while the lack of the sclerome, another character of *ashmeadi,* occurs also in both the light and dark specimens in which the scutellum is weakly punctate.

In listing *henshawi* among the synonyms of *lineatus* I am following Perkins, despite the fact that Ashmead himself identified as *henshawi* a specimen of *Abanchogastra hawaiiensis* (Ashmead),

apparently at the time he wrote the paper in which both *hawaiiensis* and *henshawi* were described. It seems possible that this is another instance like that pointed out by Perkins in which Ashmead described from a single specimen his *Pleuroneurophion hawaiiensis* and then identified other specimens of the same species as *Ophion nigricans* Cameron. However, since Perkins has synonymized *henshawi* with *lineatus* after seeing the types of both species it seems best at this time to follow his synonymy.

When present, the proximal sclerome (fig. 11) is distinctly distad of a line perpendicular to the costal margin at the base of the radial cell.

Enicospilus funereus Perkins

Enicospilus funereus Perkins, Trans. Ent. Soc. London, 1914: 525, 1915.

Some specimens that I identify as the large dark form of *lineatus* (*mauicola*) agree fairly well with the description of this species, and I suspect that it should be synonymized. The only character that I cannot find in one or another specimen of *lineatus* is the "unusually strongly and densely punctured" second tergite, and I suspect that the punctured appearance is due to the drying of some foreign fluid at the bases of the fine hairs, such as I have observed on a few specimens. In Perkins' key, in which the only description of the species occurs, it is finally separated from *mauicola, lineatus,* and *ashmeadi,* all herein treated as synonymous.

13. **Enicospilus (Enicospilus) waimeae** Ashmead

Enicospilus waimeae Ashmead, Fauna Hawaiiensis, 1 (3) : 348, 1901; Perkins, Trans. Ent. Soc. London, 1914: 525, 533, 1915.

There is in the United States National Museum one female specimen with the sclerome large as described by Perkins for the type specimen (fig. 12). Like the type it is from Mt. Waimea, Kauai, where it was taken at 4,000 ft. in 1894 by Perkins. Except for the size and form of the sclerome it differs hardly at all from large dark specimens of *lineatus,* and very likely will have to be synonymized with that species; but I have seen no other specimen that approaches it in the size of the sclerome. The sclerome also is somewhat farther basad than in *lineatus,* its proximal margin very slightly basad of a line perpendicular to the costal margin at the base of the radial cell.

14. **Enicospilus (Enicospilus) variegatus** Ashmead

Enicospilus variegatus Ashmead, Fauna Hawaiiensis, 1 (3) : 348, 1901; Perkins Trans. Ent. Soc. London, 1914: 525, 533, 1915.

Of this very distinct species there are a female and a male,

the latter identified by Ashmead, in the United States National Museum.

In color the thorax is very similar to that of *nigrolineatus,* yellowish and black, but the black is much more extensive, including the lateral lobes of the mesoscutum, most of the area of the mesopleuron, the metapleuron, and all the propodeum except around the spiracles. Unlike that of *nigrolineatus* the abdomen is dark with the upper edge of the compressed portion yellowish. The fenestra (fig. 13) is essentially like that of *lineatus,* but with the proximal sclerome slightly farther basad and with a faint sclerotization along the distal margin of the fenestra.

15. **Enicospilus (Enicospilus) nigrolineatus** Ashmead

Enicospilus nigrolineatus Ashmead, Fauna Hawaiiensis, 1 (3) : 348, 1901; Perkins, Trans. Ent. Soc. London, 1914: 524, 533, 1915.

One of the most distinct of the Hawaiian species, immediately recognizable by the only slightly variable color pattern of the thorax—yellowish ferruginous with a median black stripe on the mesoscutum and the mesosternum and the propodeum posterior to the carina also black. It is equally distinct in the form of the proximal sclerome (fig. 14), which is elongately triangular with appendix underlying the fenestra to the apex and is situated distinctly apicad of a line perpendicular to the costal margin at the base of the radial cell. The stigma is very narrow and the second discoidal cell narrow with upper and lower margins nearly parallel for about half the length and the second recurrent about a third as long as the basal abscissa of the subdiscoideus.

I have seen 23 specimens from Kauai, Oahu, Maui, Molokai, and Hawaii.

16. **Enicospilus (Enicospilus) longicornis** Ashmead

Enicospilus longicornis Ashmead, Fauna Hawaiiensis, 1 (3) : 350, 1901; Perkins, Trans. Ent. Soc. London, 1914: 524, 533, 1915.

Of this distinct species I have seen only eight specimens, seven from Hawaii and one from Maui.

The fenestra (fig. 15) is rather large; there are two distinct scleromes, the nearly equilaterally triangular proximal and elongately oval central scleromes, the latter parallel to the costal margin, and usually with a faint trace of the distal sclerome. The proximal sclerome is almost entirely basad of a line perpendicular to the costal margin at the base of the radial cell. The stigma is unusually short and broad and the second discoidal cell short with the discocubitus straight basally and convexly curved in about its apical half, the second recurrent nearly half as long as the basal abscissa of the subdiscoideus.

In this species the mandible (fig. 23) bears a conspicuous tuft of long hairs on the outer surface between the middle and the apex. Several of the other species have a few hairs in this position, but in none are they so conspicuous as in *longicornis*.

All the specimens are almost uniformly ferruginous with the head largely or entirely yellowish.

Enicospilus tyrannus Perkins

Enicospilus tyrannus Perkins, Trans. Ent. Soc. London, 1914: 524, 1915.

In Perkins' key, which furnishes the only description of this species, it is finally separated from *longicornis* only by the character "mesosternum and at least most of the propodeum black," which leads to the suspicion that it is only a somewhat dark form of *longicornis*.

17. **Enicospilus pseudonymus** Perkins

Enicospilus pseudonymus Perkins, Trans. Ent. Soc. London, 1914: 529, 1915.

This species, apparently based on a single male, is unknown to me. The lack of a fenestra, the medially elevated mesoscutum (if this is not an abnormality), and the slender basal abscissa of the radius render it anomalous in *Enicospilus*, and I suspect that a new genus should be erected for it.

Abanchogastra hawaiiensis (Ashmead)

Athyreodon hawaiiensis Ashmead, Fauna Hawaiiensis 1(3): 343, pl. 9, fig. 2, 1901; Perkins, Fauna Hawaiiensis 2 (6): 679, 1910.

Abanchogastra debilis Perkins, Trans. Ent. Soc. London, 1902: 141. New synonymy.

Athyreodon debilis Perkins, Fauna Hawaiiensis 2 (6): 680, 1910.

This species exhibits in extreme degree the variation in color characteristic of the Hawaiian Ophionini.

Before me are 10 specimens (5 of each sex), a pair of the red phase identified by Perkins as *hawaiiensis*, a pair each of the dark and intermediate phases identified by Perkins as *debilis*, a male of the intermediate phase identified by me as *hawaiiensis*, a red female identified by Ashmead as *Enicospilus henshawi*, and a pair of the red phase identified, probably by D. T. Fullaway, as *hawaiiensis*. In the red phase the body and legs are almost uniformly ferruginous, with the base of the second tergite piceous and the orbits in the female and the face, frons, vertex, and orbits in the male yellow. In the intermediate phase (*hawaiiensis*) the ferruginous is largely

replaced by piceous, the vertex and frons in the female remaining ferruginous and the yellow pattern of the male head remaining the same as in the red phase. In the dark phase (*debilis*), the piceous color is deeper in tone, nearly black on the thorax, and embraces the vertex entirely and the frons medially. It should be noted that the female described by Perkins as *debilis* (hereby designated the lectotype) is of the dark phase whereas the male is of the intermediate phase and almost typical *hawaiiensis*.

The red phase has never been named unless it is indeed *Enicospilus henshawi*. Perkins examined the types of the Ashmead species in the British Museum, and apparently found no reason to doubt

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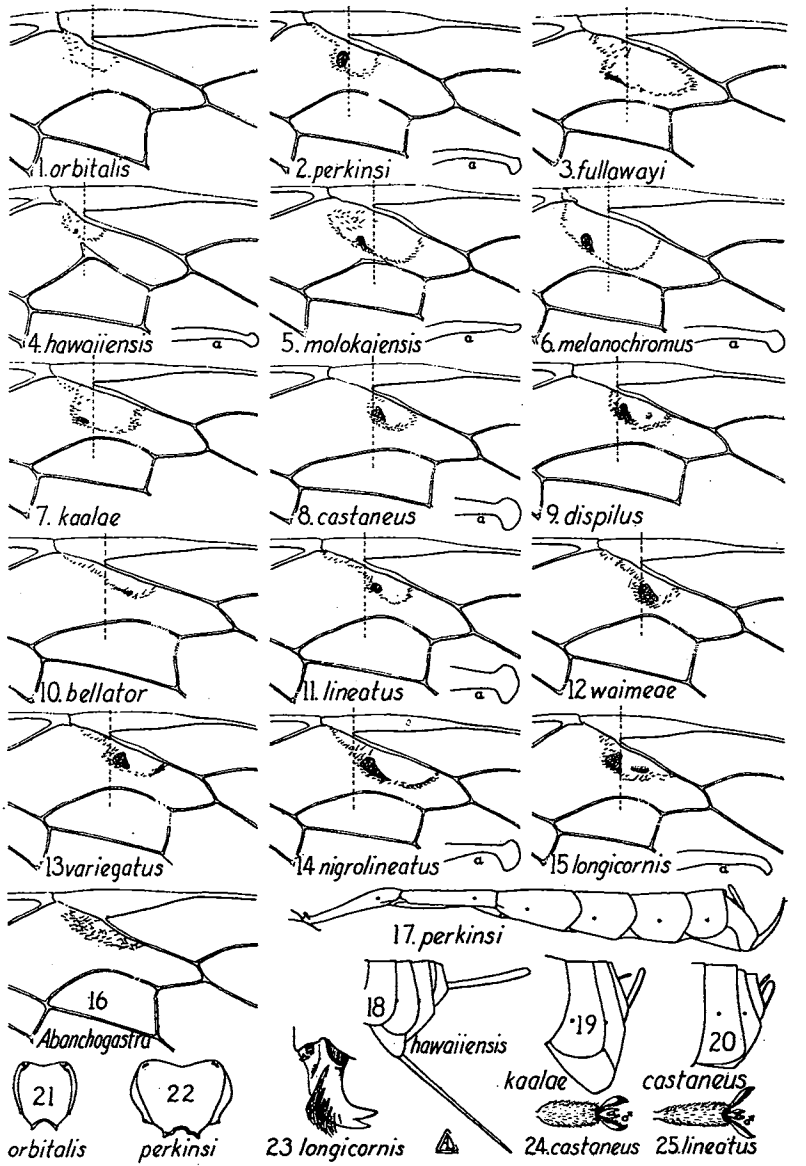
EXPLANATION OF PLATE II

Portions of forewings, aedeagi, and other details of Hawaiian species of *Enicospilus* and *Abanchogastra*.

Fig. 1. *Enicospilus orbitalis* (Ashmead). Portion of wing.
Fig. 2. *Enicospilus perkinsi*, n. sp. Portion of wing and (a) aedeagus.
Fig. 3. *Enicospilus fullawayi*, n. sp. Portion of wing.
Fig. 4. *Enicospilus hawaiiensis* (Ashmead). Portion of wing and (a) aedeagus.
Fig. 5. *Enicospilus molokaiensis* (Ashmead). Portion of wing and (a) aedeagus.
Fig. 6. *Enicospilus melanochromus* Perkins. Portion of wing and (a) aedeagus.
Fig. 7. *Enicospilus kaalae* Ashmead. Portion of wing.
Fig. 8. *Enicospilus castaneus* Ashmead. Portion of wing and (a) aedeagus.
Fig. 9. *Enicospilus dispilus* Perkins. Portion of wing.
Fig. 10. *Enicospilus bellator* Perkins. Portion of wing.
Fig. 11. *Enicospilus lineatus* (Cameron). Portion of wing and (a) aedeagus.
Fig. 12. *Enicospilus waimeae* Ashmead. Portion of wing.
Fig. 13. *Enicospilus variegatus* Ashmead. Portion of wing.
Fig. 14. *Enicospilus nigrolineatus* Ashmead. Portion of wing and (a) aedeagus.
Fig. 15. *Enicospilus longicornis* Ashmead. Portion of wing and (a) aedeagus.
Fig. 16. *Abanchogastra hawaiiensis* Ashmead. Portion of wing.
Fig. 17. *Enicospilus perkinsi*, n. sp. Abdomen of female.
Fig. 18. *Enicospilus hawaiiensis* (Ashmead). Apex of abdomen of female.
Fig. 19. *Enicospilus kaalae* Ashmead. Apex of abdomen of female.
Fig. 20. *Enicospilus castaneus* Ashmead. Apex of abdomen of female.
Fig. 21. *Enicospilus perkinsi*, n. sp. Propodeum and metapleura.
Fig. 22. *Enicospilus orbitalis* (Ashmead). Propodeum and metapleura.
Fig. 23. *Enicospilus longicornis* Ashmead. Mandible.
Fig. 24. *Enicospilus castaneus* Ashmead. Apical joint of front tarsus of male.
Fig. 25. *Enicospilus lineatus* (Cameron). Apical joint of front tarsus of male.


1. orbitalis
2. perkinsi
3. fullawayi
4. hawaiiensis
5. molokaiensis
6. melanochromus
7. kaalae
8. castaneus
9. dispilus
10. bellator
11. lineatus
12 waimeae
13 variegatus
14 nigrolineatus
15 longicornis
16
Abanchogastra
17. perkinsi
18
hawaiiensis
19
kaalae
20
castaneus
21
orbitalis
22
perkinsi
23 longicornis
24. castaneus
25. lineatus

the inclusion of *henshawi* in *Enicospilus,* but, except for the lack of the alar sclerome, the specimen labelled *henshawi* by Ashmead agrees better with the description than do specimens identified by Perkins as *lineatus* Cameron (with which Perkins synonymizes *henshawi*), notably in the very strongly arched discocubital vein and the very narrow base of the second discoidal cell. Moreover, among the 26 specimens of *lineatus* that I have seen none is nearly so small as the type of *henshawi.*

I recognize *Abanchogastra* as a genus distinct from *Enicospilus* entirely on characters of venation (fig. 16), the body characters being those of *Enicospilus.* The complete lack of the fenestra, the rather broad stigma with the radius much farther from the base, and the reclivous nervellus broken at or above the middle, features characteristic of *Ophion,* appear sufficient for generic distinction.